

REMARKS

Reconsideration of the claims in light of the following remarks is requested. Upon entry of this amendment Claims 1 – 6, and 8 – 25 are pending and under consideration. Claims 7 and 26-28 are canceled. Applicant respectfully submits that no new matter is added by this amendment.

Applicants have not dedicated or abandoned any unclaimed subject matter and moreover have not acquiesced to any rejections made by the Patent Office. Applicants reserve the right to pursue prosecution of any presently excluded claim embodiments in future continuation and/or divisional applications.

Claim Rejections - 35 U.S.C. § 103

1. Claims 1-9, 12-16, and 19-23

Claims 1-9, 12-16, and 19-23 stand rejected under 35 U.S.C. § 103 (a) as being unpatentable over Baum et al., (U.S. Patent No. 6,869,638) (“*Baum*”). Applicants respectfully traverse.

When rejecting claims under 35 U.S.C. §103, the Examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. MPEP § 2142. The inquiry of obviousness is controlled by the *Graham* factors. See *KSR International Co. v. Teleflex Inc.* 127 S.Ct (2007) (citing *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1 (1966)). These factors are: 1) the scope and content of the prior art; 2) the differences between the prior art and the claims; 3) the level of ordinary skill in the pertinent art; and 4) objective evidence of nonobviousness.

A. *Baum* does not teach “introducing ozone into the reaction chamber wherein the temperature of the wafer is below 300°C.

Baum does not teach “introducing ozone into the reaction chamber wherein the temperature of the wafer is below 300°C.” In fact, *Baum* does not teach using any particular temperature for the oxidizing step. *Baum* teaches only a temperature range for the entire process, not the oxidizing step.

Baum generally teaches that, “The deposition of the dielectric thin films of the present invention are preferably carried out under an elevated deposition temperature range of from about 250°C to about 750°C,” col. 15, ll. 58-61, which is a temperature range of 500 °C. Moreover, all of the examples given in *Baum* show testing performed at temperatures between a range of 350°C and 700°C, with the lowest actual values tested being 400°C. (Examples and Figures 2, 4, and 6-11.) In contrast, the claims of the present invention as amended specifically teach performing the oxidizing step at below 300°C.

The only arguable overlapping range of the current claim and *Baum* is between 250°C and 300°C. This is only a 50 degree temperature range, one tenth of the 500 degree temperature range disclosed in *Baum*. Applicant respectfully submits that *Baum* does not actually enable anyone to use, nor does *Baum* suggest using, the lowest tenth of its disclosed temperature range. All of the experiments reported in *Baum* are performed at 400°C or higher. (Examples and Figures 2, 4, and 6-11).

B. *Baum* teaches away from using low temperature.

In particular, Applicants respectfully draw Examiner’s attention to Figure 3 of *Baum*, which shows that the deposition rate using N₂O as the oxygen source at 550°C is only about 5Å/min, which equals to 0.08 Å/sec. This is an exceedingly low deposition rate as can be appreciated by a skilled artisan. The data provided in Figures 10 and 11 of *Baum* also show a trend of very low deposition rate at temperatures lower than 400 °C. Thus, a skilled artisan, upon reading *Baum*, would not carry out the process at a temperature lower than 300°C because the data trend provided by *Baum* suggests that the deposition rate would be very low at a temperature lower than 300°C, and thus unacceptable.

C. *Baum* teaches away from using ozone.

When studying the examples of *Baum* it is clear that *Baum* does not use the ozone as the oxidant, and in fact Applicants submit that the disclosure of *Baum* actually *teaches away* from using ozone. This is because traditionally, oxygen gas and steam have been preferred oxidants in an ALD processes. Although ozone has been recognized as an oxidant, it is disfavored due to its relatively high instability. As explained in the current application, “oxygen gas requires operating temperatures of around 400°C, ozone permits operating temperatures below 300°C.”

(page 7, lines 21-23, emphasis added.) Therefore, it is unlikely that the inventors of *Baum* would have considered performing an oxidizing step with ozone because *Baum*'s requires a temperature of 400°C. In fact, since ozone operates at a lower temperature process and is considered unstable at higher temperatures, it would not be suitable for use in *Baums*' experiments. *Baum* does not use ozone, nor does *Baum* operate at a temperature below 400°C in any of its examples.

Regarding the oxidizing step, *Baum* teaches, "Oxidizing gases useful for the broad practice of the present invention include, but are not limited to, O₂, N₂O, NO, H₂O, and O₃. More preferably, the oxidizer used comprises N₂O." (*Baum*, Col. 15, lines 54-57). In other words, although *Baum* discloses that O₃ may be used, *Baum* gives no examples of using O₃ as the oxidizer in an ALD process, nor does *Baum* disclose carrying out an oxidizing step with O₃ at temperatures of below 300 °C as recited in the amended claims. The only ALD examples that *Baum* disclose all use N₂O as the oxidizer. *Baum* discloses four examples of an ALD process, and in all four examples N₂O is used as the oxidizer. (*Baum*, Col. 14, lines 45-53.)

D. *Baum* is directed to a CVD process, rather than ALD process and it does not enable a ALD process carried out at a temperature below 300°C with ozone as oxygen source.

The pending claims are directed to a method of growing a metal silicate film on a substrate by atomic layer deposition (ALD) process. In contrast, *Baum* is directed primarily to compositions used in chemical vapor deposition (CVD) process. See Abstract and the claims. Applicants respectfully submit that *Baum* does not enable the practice of ALD process with ozone as oxidant to be carried out at a temperature below 300°C.

Baum only discloses in general term that the compositions can used in "atomic chemical vapor deposition (ALCVD)." Col. 14, ll. 5-6, and provides an example track 2 for a ALCVD process. Col. 14, ll. 47-48. However, *Baum* does not teach that such process is carried out with ozone as oxygen source and to be carried out at a temperature below 300°C, not to mention to enable such process. A skilled artisan will appreciate that in reality *Baum* is directed to a CVD process, not an ALD process, despite the brief mention of ALD in col. 14. It is evidenced by both the examples and claims of *Baum*, all are directed to CVD process. For example, all the data in figures 2-6 are related to a CVD process, not an ALD process.

In summary, *Baum* does not teach “introducing ozone into the reaction chamber wherein the temperature of the wafer is below 300°C.” *Baum* does not enable by any example the use of ozone. *Baum* does not describe specific process temperatures of below 400°C in any of its examples. Applicant respectfully submits that one of skill in the art would not have been taught by *Baum*’s broad temperature ranges and large list of oxidizers, which produces multitudes of possible combinations, to utilize an oxidizing step in an atomic layer deposition by “introducing ozone into the reaction chamber wherein the temperature of the wafer is below 300°C” as recited in Applicants amended claims. In fact, based on the experiments described in *Baum*, one would be taught away from the process conditions of Applicant’s amended claims.

2. Claims 10, 11, 17, 18, 24 and 25

Claims 10, 11, 17, 18, 24 and 25 stand rejected under 35 U.S.C. § 103 (a) as being unpatentable over *Baum* in view of Metzner et al. (US Patent Application Publication 2003/0232506) (“*Metzner*”). Applicants respectfully traverse.

Claims 10 and 11 depend from claim 1; claims 17 and 18 depend from claim 12; claims 24, and 25 depend from claim 19. As presented above, *Baum* does not teach an oxidizing step in an atomic layer deposition by “introducing ozone into the reaction chamber wherein the temperature of the wafer is below 300°C.” Applicant respectfully submits that *Metzner* adds nothing more.

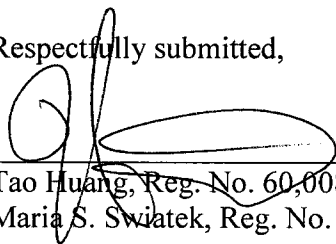
When *Metzner* discloses forming a hafnium silicate layer, it discloses that, “The hafnium silicate layer is formed at temperatures in the range of about 325°C to about 700°C... Preferably, the hafnium silicate layer is formed at about 600°C.” Paragraph [0073]. Therefore, the disclosed temperature range of Metzner, even at its lowest end, is above the claimed temperature range of “below 300°C.”

For the foregoing reasons, *Baum* and *Metzner*, either alone or in combination, fail to teach each and every limitation of the claimed invention. Therefore, the Applicant respectfully requests that the rejections to claims 10, 11, 17, 18, 24, and 25 be withdrawn.

CONCLUSION

Based on the foregoing, Applicant submits that Claims 1 – 6, and 8 – 25 are in condition for allowance. An early indication of the same is therefore respectfully requested. If any matters can be resolved by telephone, the Examiner is invited to call the undersigned attorney at the telephone number listed below. No fees beyond those being submitted concurrently herewith are believed due. However, the Commissioner is authorized to charge any additional required fees, or credit any overpayment, to Morgan, Lewis & Bockius LLP Deposit Account No. 50-0310 (Order No. 067538-5171-US).

Respectfully submitted,



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